> Australia] and are thus rendering more and more difficult the exploitation of the people and the resources of a large part of the world by a small favoured class."

Under the heading of " Peoples Possessing Unused Lands " the British naturally figure prominently, and this, it would appear, for the interesting reason that our birth rate is so low (p. 292) :

> " Russia, too, apparently has great areas of unused land in Siberia and great mineral resources which have not yet been opened up. But Russia cannot be classed with Great Britain and France as a ' dog in the manger ' because the Russians are still a ' swarming ' people."

The empty lands of the United States do not, naturally enough, come into this discussion. It is mentioned that the population of Alaska is diminishing steadily, merely to show that we need no further discuss so unimportant a place. It is not mentioned that the same is true of the rural areas of the States themselves.

The book is worth reading as representing a current of American feeling which might otherwise be unnoticed in this country, but the publishers would perhaps have been wiser to leave out the word " unbiased " from their remarks on the cover.

R. A. Fisher.

PROGRESS OF SCIENCE

Dampier-Whetham, W. C. D., M.A., F.R.S. *A History of Science: and its Relations with Philosophy and Religion.* Cambridge, 1929. University Press. Pp. 514 + xxi. Price 18s.

In his *History of Science* Mr. Whetham has made an attempt at something intrinsically very difficult, nothing less than a complete and perfectly balanced account of the main features of the history of that branch of human experience which we call natural science. Doubtless he will not be the last to make this historical synthesis; but he has certainly produced a book which will be of great value to his contemporaries, taking the place, to a large extent, of Whewell's well-known work. Undeterred by the vastness of the field, he ranges from the opinions of the Pre-Socratic Ionians to the most recent cosmogonies of Jeans and Eddington, and from the earliest Greek alchemists to the hormones and vitamines of to-day.

A glance at his arrangement shows that about three-fifths of the book is devoted to the science of the nineteenth century and after, probably a wise proportion in view of the many side-tracks which students of ancient and mediæval science are liable to be lured into. Mr. Whetham keeps strictly out of such side-tracks; he pays the minimum amount of attention to biographical detail, confining himself, as a rule, to date and place of birth, and he avoids all suspicion of interest in " quaint detail." These merits, however, have their own defects, and lead to a certain dullness in the presentation of the material, making what might have been fascinating merely useful. Thus when Frontinus, the Roman engineer, is mentioned on page 59, it would have taken only a line or two to include his exquisite words, illuminating as they do the Roman character, "With these immense structures, carrying so many waters, compare if you will, the useless though famous, works of the Greeks."

Mr. Whetham's first chapter takes us from the remotest antiquity (though unduly little is said, perhaps, about ancient India and China) up to the end of the Hellenistic Age. The treatment here is very adequate, though one misses an account of Aristotle's views on causation, so important for all later science, and it is perhaps time that the doubtful legend about Alexander's army collecting specimens for Aristotle was allowed to fall into oblivion.

Again, in the discussion of Galen no mention is made of his doctrine of faculties or of his *De Usu Partium,* both so influential in later times. The next chapter, which deals with the Dark and Middle Ages, is also very interesting, but some will feel that Albertus Magnus has not been given sufficient prominence, and on page 102, where

the decay of scholasticism is under consideration, it is a pity that no mention is made of the " two-truth theories " and their expounders, such as John of Jandun. The great Cardinal Nicholas of Cusa also comes off badly, without even a note, in spite of his central position in these questions. On the other hand the account of Roger Bacon is admirably done.

The third chapter is on the Renaissance period, and here a critical survey would take exception to the footnote on page 130, which states that Fabricius ab Aquapendente was the first to examine hen's eggs since Aristotle, for earlier Renaissance embryologists were numerous—e.g. Volcher Coiter, Ulysses Aldrovandus, Jacob Rueff, and many others, to say nothing of fifteenth-century efforts in the same direction. And while speaking of embryology, it must be pointed out that although Malpighi is dealt with on page 132 and Wolff on page 278, no account whatever is given of either the preformation-epigenesis controversy or the ovism-animalculism controversy, although a good account of the latter has appeared lately in the *American Naturalist* by R. C. Punnett, and, considering the space devoted to phlogiston, one would have expected some account of the corresponding pit which biologists fell into. It is only, after all, by the study of the mistakes of our predecessors that we can derive one of the greatest benefits which the history of science offers us, namely the open mind, the " palladium of freedom " as Louis Choulant called it.

Little improvement could be made in the discussion of the late seventeenth and eighteenth centuries, and the sections devoted to Isaac Newton are among the best in the book; Mr. Whetham, " as in private duty bound," has clearly paid loving attention to the illustrious physicist and chemist of his own College. But we may complain, perhaps, that he has followed the usual course of commentators on Robert Boyle's *Sceptical Chymist* and failed to recognize the emphasis on the quantitative and metrical requirements of scientific method for which the Father of Chymistry argued through the mouth of Carneades. And on page 203 he merely reproduces Sir Michael Foster's catalogue of the achievements of A. von Haller, thereby missing some which were much more remarkable, such as his work on growth-rates of animals and plants. Lastly, many admirers of Kant will not feel quite satisfied at Mr. Whetham's account of the Copernican revolution in philosophy effected by that admirable if irritating philosopher.

Now it is evident that a trivial work would not have invited the foregoing detailed criticisms, and we may regard the present book, indeed, as the very antithesis of triviality. We may go further and pay it the profounder honour of criticizing its fundamental historical conceptions. There seems to be little doubt that some theory of continuous progress is adopted by Mr. Whetham, and it would have been well if he could have been more definite in his use of it. His book shows no trace of the consciousness of rises and falls in the forms of experience, with which many recent writers have made us familiar. Thus on page 66 he hopes to understand why natural science all but vanished from the earth in the Middle Ages by studying Christian theology, and on page 111 gives up as a hopeless puzzle the " causation " of the Renaissance. His account of science would have been more striking if he could have emphasized more the wave-form which it seems to show, rising sometimes to great heights, as in the Hellenistic Age and in our own, and falling correspondingly. But perhaps he was right in eschewing the cycle form and restricting himself to a mere recital of the facts discovered and the advances made; for it is likely that the Spenglerian outlook is the science of history rather than history itself. What is here criticized is that this restriction seems to have been unconscious rather than conscious.

The last part of the book, i.e. from 1800 onwards—presents the form of a general, not too elementary account of the basic notions of modern science, rather than of a historical treatise, although, of course, the historical method is still followed. The

theme is pursued right up to the days in which we are living, the days of Schrödinger's wave mechanics and Morgan's theory of the gene. The last hundred and fifty pages deal with times which we cannot yet see in historical perspective and which need not therefore be criticized here. All that need be added is that in Mr. Whetham's book we have a guide to the history of science which every scientific worker ought to possess if he needs, as he probably does, a stimulus for his activity, a guardian for his openness of mind, and a door into another tract of experience, the realm of Clio.

JOSEPH NEEDHAM.

SHORTER NOTICES

The American Academy of Political and Social Science. *The American Negro: The Annals.* Vol. CXXX. November 1928. Philadelphia, 1928. Pp. viii + 359.

To review a volume containing many articles written from very different standpoints is always difficult. One general statement arising from the study of the book is that undoubtedly a new attitude towards race biology and its problems is developing among more thoughtful people. It is beginning to be realized that much of what has been considered 'race' prejudice is really 'class' prejudice in another form. Negroes all over the world, even to-day, are mainly occupied in menial positions, though to a much lesser extent than fifty years ago. The negro in America has also the class stigma of his former slave status; and, though abstract morality may suggest that to be a slave-owner was a more despicable thing than to be a slave, Society does not build its scale of values on abstract morality.

One writer suggests that the negro, by his acquiescence in slavery, showed his inferiority. But that acquiescence, though it is true of the survivors, neglects the numbers of negroes who died rather than be enslaved. It neglects, too, the fact that humanity everywhere tends to acquiesce in the social order in which it finds itself, and that the few who rebel against local society do so at peril of their life and liberty, in some cases, and in all cases risk losing that esteem of our fellows which is so dear to man's gregarious soul.

Children born into slavery in America had no standard by which to measure the depth of their degradation or the possibilities of other ways of life. A study of the papers on the economic position of the negro in the United States reveals how far-reaching and unexpected are the results of national action on the individual. When the European War broke out in 1914, no one could have foreseen that one of its effects would be the movement of negroes into the industrial life of the North, with its resultant sharpening of race contacts. Those who were so ardent in desiring restriction of immigration certainly did not consider that this would raise the status of the negro and bring him more closely into the industrial net.

The present sharp 'colour' antagonism is accentuated by the fact that an ever-increasing number of negroes are gaining culture and education, and entering the professional classes.

There are chapters on the negro in business and in the professions, and on the negro's contribution to American art and literature. Thus, while one section of the dominant white race tries to devise intellectual tests to prove its mental superiority to the negro, a section of the negro race achieves distinction in medicine, the law, literature, art, and music, and thus proves its ability to enter social strata which were once considered closed to it. When an oppressed and despised race has passed through the ineffectual and stagnant stage of self-pity (see p. 238) and begins to concentrate on active achievement, it has gained self-freedom, with all that that entails in progress. It is significant that a large element of approval has been won for negro effort among thoughtful Americans, as this volume bears witness; and everything that makes for mutual appreciation tends towards peace in this most urgent problem of life in the United States. We quote, without comment, the last paragraph in the book:

"To sum up, there seems at present little serious danger of the spread of colour prejudice in Europe. England and France particularly know that their futures as world powers are to a large extent dependent upon the wealth and man power which come from the black colonies.